INTEGRATED GEOSPATIAL SYSTEMS TO VISUALIZE FUTURE ARMY INSTALLATIONS

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Introduction

The Army approaches information dominance with the stance that a common view of the terrain will provide more coherent command and control on the battlefield. Developing systems for training, planning, and implementing operations requires access to integrated databases containing terrain, weather, and battlespace environment data. The same concept is critical to the overall life cycle of planning, acquiring, and operating installations.

The introduction of the Army's new Transformation of Installation Management (TIM) regional centers has placed an even greater premium on common access to comprehensive data concerning installations. The ability to tie planning and operations activities together at the installation, major command (MACOM), and TIM levels depends on integrated information databases that facilitate a common picture for all involved. This is especially true when exploiting "Fort Future"-type modeling and simulation (M&S) tools that are described in more detail in other articles in this magazine.

A special challenge in providing this capability is in accessing the different types of critical geospatial data needed to support the M&S process. (For the purposes of this article, geospatial data refer to the metadata, attribute, and locational components of the data.) These data need to be closely linked to the primary information used for installation management, as well as provide the basis for in-depth analysis of complex issues such as environmental consequences of training, security and protection, and energy utilization. Historically, geospatial data have not been centrally stored, managed, or shared among those agencies that maintain the data.

Nearly every decision made during installation transformation will be supported in some fashion using geospatial data. Thus, the Army needs accessible, current geospatial data and initiatives that promote data sharing, integration, and compatibility at the global, regional, and local levels. To serve this need, the Office of the Assistant Chief of Staff for Installation Management (OACSIM) is developing the enterprise Geospatial Information System Repository (GIS-R). This data warehouse will provide foundational data necessary to support the collaborative M&S concept in Fort Future and support business processes within the Army's new TIM regional centers.

Background

Three key enabling technologies—remote sensing, Global Positioning System, and Geographic Information System (GIS)—have given battlefield commanders a profound advantage in dominating the "infosphere." Joint Vision 2010—the Joint Warfighting Strategic Plan—recognizes information superiority as the foundation for joint warfighting doctrine and concepts as we move toward 2010. GIS provides a toolbox to integrate data from diverse sources and visually analyze it to support decisionmaking many times faster than alternative methods. Installation commanders and other stakeholders can similarly gain information superiority by making strategic use of geographic data to support the life cycle of installations from operations to master planning.

During the past 20 years, MACOMs and installations have invested in a variety of GISs and associated geospatial data. These data have been developed and gathered to enable the installation to more efficiently perform tasks such as master planning, environmental assessments and studies, military construction programming, range operations, emergency response and management, maintenance, scheduling, real estate management, and a host of other installation functions.

Since the early 1990s, the Army has invested in computer-aided drafting and design (CADD) and GIS standards across the Services (i.e., via the CADD/GIS Technology Center—**http://tsc.wes.army.mil**). This effort does not eliminate differences in data storage formats between platforms but is a major step in ensuring that consistent data attribution is found in each system.

A common repository for geographic information can offer a portal through which all stakeholders can extract useful planning information about Army installations guided by mutually agreed-to data views. This portal would support "single data access" at all levels and simultaneously support multiple users at all levels. Use of a widely accessible data repository enables stakeholders at different levels to control what data are available for viewing, plan for and monitor periodic updates, and provide one auditable source for use when presenting data outside the Army.

Common and coordinated geospatial data from Army installations can provide valuable planning insights. The GIS provides a visual, as well as an analytical, view of data by displaying spatial relationships. These relationships add extra value to other installation data and represent a more complete picture of conditions affecting Army installations (e.g., range development and endangered species habitats).

Data Management Issues

Management of geographic information has posed many challenges for installations. Because GIS capabilities emerged through a largely unplanned

process, geospatial data management traditionally received limited support. It was difficult to justify expenditures to decisionmakers who did not understand the technology or its capabilities as a decision support tool.

Geospatial data are not generally accessible or shared for several reasons: the data are not in digital format or digital data is in a nonstandard format; components of the data, such as metadata and attributes, are missing or incomplete; acquisition is not coordinated; and it is handled and stored on diverse hardware, software, and databases.

The result has been isolated "islands" of geospatial technology, creating a communication barrier that precludes the Army from realizing full benefits of the investment in geospatial data. Further, reliance on specialty servers, stand-alone systems, and local interfaces drives up the cost of systems administration and management.

Geospatial Data

GIS-R is a Web-based enterprise decision-support framework for Army installation geographic information. It is modeled after a similar effort by the U.S. Army Training and Doctrine Command (TRADOC) called the TRADOC Corporate Database. GIS-R will incorporate Army activities worldwide and interface with existing databases (e.g., Installation Status Report or Integrated Facilities System). Development is being coordinated with the other Services to ultimately provide a DOD-wide repository.

GIS-R is intended to be one of several tools in a suite of decision-support tools to be used at all levels (headquarters, region, and installation). Its goals include the following:

• Be an easy-to-use interface with links to multiple data to get an integrated, spatially enabled solution;

• Provide instant access to summary information needed for briefings, information requests, and research;

• Provide embedded standards for geospatial data required for decision-making; and

• Be compatible with the use of commercial, off-the-shelf software.

GIS-R is not intended to replace local GIS efforts. The objective is to standardize efforts and have installations at the "minimum reporting requirements" level, which can be built on to meet local planning needs.

GIS-R Status

To date, the prototype repository has been completed for five installations: Forts Bragg, Meade, and Benning; Camp Swift; and Darmstadt, Germany. Developers are expanding an ArcView software application to allow for analysis across all installations at the world, U.S., Europe, and vicinity levels. "Inside the installation boundaries" will be incorporated as installations begin to provide data in the required format. As with any effort to insert new technology into existing business practices, GIS-R requires supporting policy and guidance.

OACSIM has issued interim policy and guidance for GIS technologies as well as a strategic plan for GIS-R. The plan provides guidance to facilitate the analysis and implementation of geospatial data within the installations' organizational business process. It is designed to assist installations in assessing the need, recognizing the impacts, and defining a process-oriented strategy for the development and maintenance of geospatial data. The plan establishes the shared vision for geospatial information management, top goals and objectives, measures of performance, strategies to accomplish the goals, and benefits of achieving the goals.

In addition to providing policy and guidance, OACSIM will help integrate GIS-R across all installation management functional areas. This includes providing assistance to installations in converting to the spatial data standards for facilities, infrastructure, and the environment, and in developing the required geospatial data layers for use in the GIS-R.

Benefits

An enterprise geospatial data repository improves the efficiency and effectiveness of geospatial data management at the local level. Specific benefits include the following:

• A "one-stop" common repository is provided for GIS activities that are dispersed at all levels.

• All aspects of geospatial data—the spatial, the metadata, and the attribute components—are included.

• GIS analysts can spend more time providing decision support assistance and less time filling requests for data.

• With a common, agreed-upon framework for data storage, upload, and download, less staff time is spent on designing solutions that are ad hoc.

• Connection to applications is more straightforward in a system based on a database management system than in a system based on data read directly from files.

Conclusion

The GIS-R development is timely to meet emerging requirements for M&S in support of Army installation transformation. This enterprise data repository will increase the power and accuracy of models to predict how our installations will need to evolve to support the Objective Force. For further information, go to the GIS-R Web site at **http://gisr.belvoir.army.mil** or contact Linda W. Smith, OACSIM Plans and Operations Division, at (703) 692-9222, DSN 222-9222, or **linda.smith@hqda.army.mil**.

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